



wwPDB EM Validation Summary Report ⓘ

Jul 15, 2024 – 07:31 am BST

PDB ID : 8BH3
EMDB ID : EMD-16044
Title : DNA-PK Ku80 mediated dimer bound to PAXX
Authors : Hardwick, S.W.; Chaplin, A.K.
Deposited on : 2022-10-28
Resolution : 4.55 Å (reported)

This is a wwPDB EM Validation Summary Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

EMDB validation analysis : 0.0.1.dev92
MolProbity : 4.02b-467
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.37.1

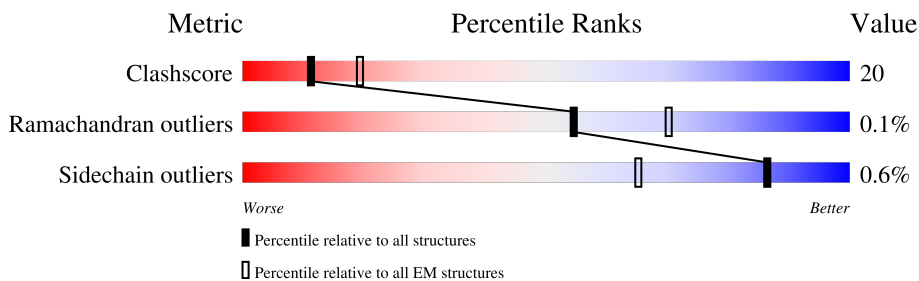
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 4.55 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion $< 40\%$). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	4128	
1	S	4128	
2	B	609	
2	T	609	
3	C	732	
3	L	732	
4	D	204	
4	M	204	

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Mol	Chain	Length	Quality of chain
5	G	336	<p>18% 43% 16% 40%</p>
5	H	336	<p>26% 44% 12% 42%</p>
5	P	336	<p>25% 51% 8% 40%</p>
5	Q	336	<p>26% 48% 9% 42%</p>
6	I	911	<p>17% 10% 73%</p>
6	R	911	<p>17% 10% 73%</p>
7	j	25	<p>100%</p>
8	i	27	<p>100%</p>
9	d	26	<p>96%</p>
10	e	28	<p>96%</p>

2 Entry composition [i](#)

There are 10 unique types of molecules in this entry. The entry contains 89245 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called DNA-dependent protein kinase catalytic subunit.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	3550	Total	C	N	O	S	0	0
			27927	17939	4728	5074	186		
1	S	3540	Total	C	N	O	S	0	0
			27999	18001	4725	5087	186		

- Molecule 2 is a protein called X-ray repair cross-complementing protein 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	507	Total	C	N	O	S	0	0
			4038	2587	686	747	18		
2	T	502	Total	C	N	O	S	0	0
			4014	2569	680	747	18		

- Molecule 3 is a protein called X-ray repair cross-complementing protein 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	C	668	Total	C	N	O	S	0	0
			5292	3382	884	1000	26		
3	L	652	Total	C	N	O	S	0	0
			5174	3304	871	973	26		

- Molecule 4 is a protein called Protein PAXX.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	D	147	Total	C	N	O	S	0	0
			1075	689	183	197	6		
4	M	164	Total	C	N	O	S	0	0
			1195	754	207	228	6		

- Molecule 5 is a protein called DNA repair protein XRCC4.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	G	201	Total	C	N	O	S	0	0
			1628	1031	278	312	7		
5	H	194	Total	C	N	O	S	0	0
			1589	1009	271	302	7		
5	P	201	Total	C	N	O	S	0	0
			1628	1031	278	312	7		
5	Q	194	Total	C	N	O	S	0	0
			1589	1009	271	302	7		

- Molecule 6 is a protein called DNA ligase 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	I	246	Total	C	N	O	S	0	0
			1977	1256	336	372	13		
6	R	246	Total	C	N	O	S	0	0
			1958	1240	332	373	13		

- Molecule 7 is a DNA chain called DNA (25-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
7	j	25	Total	C	N	O	P	0	0
			509	244	86	154	25		

- Molecule 8 is a DNA chain called DNA (27-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
8	i	27	Total	C	N	O	P	0	0
			552	265	102	158	27		

- Molecule 9 is a DNA chain called DNA (26-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
9	d	26	Total	C	N	O	P	0	0
			528	253	89	160	26		

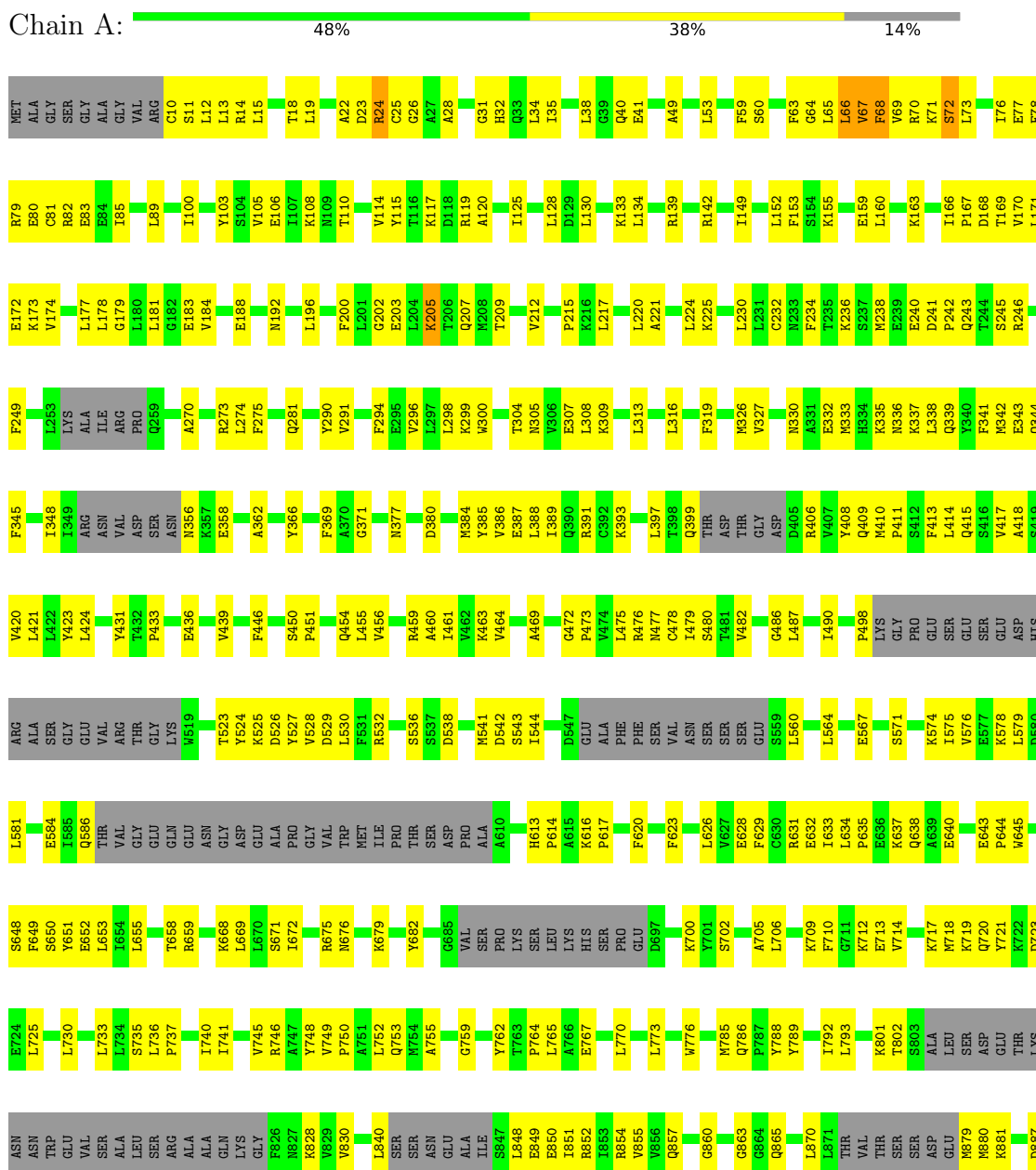
- Molecule 10 is a DNA chain called DNA (28-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
10	e	28	Total	C	N	O	P	0	0
			573	275	107	163	28		

3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

- Molecule 1: DNA-dependent protein kinase catalytic subunit



K3192	K3264	K3266	K3267	K3268	K3269	W3272	L3273	S3274	S3275	W3276	W3277	Q3278	C3281	H3285	C3286	R3287	S3288	R3289	S3290	Q3291	Q3292	C3293	R3296	T3303	V3304	L3307	N3319	L3320	L3321	R3322	S3323	R3324	C3324	D3325	F3326	N3327	K3328	L3329	L3330	T3333	L3337	A3340	D3354	K3356	L3360	G3364	S3364	L3262	S3364	H3263					
SER	THR	PRO	LEU	PRO	GLU	ASP	ASN	SER	MET	VAL	ASP	GLN	GLN	GLY	ASP	PRO	SER	ARG	MET	GLU	VAL	ASP	GLN	GLY	GLU	GLU	GLU	GLY	L3327	S3329	L3330	L3321	R3322	S3323	C3324	D3325	F3326	N3327	K3328	L3329	L3330	T3333	L3337	A3340	D3354	K3356	L3360	G3364	S3364	L3262	S3364	H3263			
SER	E3368	D3369	K3372	V3373	R3380	H3384	A3388	V3389	Q3390	A3391	A3392	E3393	E3394	E3395	ALA	GLN	PRO	PRO	SER	TRP	SER	VAL	GLN	CYS	GLY	PRO	ALA	A3407	G3408	V3409	L3410	Y3413	M3414	T3415	L3416	F3419	C3420	D3421	Q3422	Q3423	L3424	R3425	K3508	D3509	Q3510	A3511	V3512	A3513	V3514	I3515	H3516	S3517	V3518	E3519	E3520
GLN	A3441	Y3442	A3444	L3445	V3446	K3449	A3453	N3457	K3464	A3391	R3467	L3468	L3472	E3473	Y3474	R3474	Y3475	P3476	E3477	E3478	T3479	M3483	M3483	E3486	W3493	Q3494	F3495	I3496	I3499	S3500	Q3508	D3509	Q3510	A3511	V3512	A3513	V3514	I3515	H3516	S3517	V3518	E3519	E3520												
L3521	L3522	D3523	Q3527	L3528	S3536	S3539	SER	PHE	LYS	ASP	T3545	K3550	N3551	K3552	E3553	F3554	L3558	Q3564	L3568	F3571	A3574	L3575	D3576	L3578	P3581	F3585	M3588	S3589	N3590	D3591	L3592	R3593	A3597	R3599	L3599	L3601	N3602	K3603	K3604	H3605	M3609														
R3612	M3613	L3617	D3619	P3620	L3625	A3627	F3628	R3629	R3630	I3633	Q3634	K3638	E3639	F3640	G3647	SER	LYS	LEU	LEU	ARG	MET	LYS	LEU	S3657	F3658	N3660	N3664	K3675	P3676	P3677	G3678	N3679	E3693	F3694	L3695	R3696	N3697	E3698	L3699	E3700	G3707	K3708	G3709	H3716	V3717										
R3718	L3719	A3720	D3723	E3724	R3725	V3726	M3729	R3732	R3733	H3734	P3735	K3736	L3739	L3740	R3741	G3742	H3743	D3744	E3745	R3746	P3749	F3750	L3751	V3752	G3755	E3756	D3757	L3758	D3761	Q3762	R3763	N3772	L3788	R3789	V3793	V3794	P3795	S3798	R3799	L3802	E3803	E3804	L3806	E3807	N3808	T3809									
L3812	D3813	L3814	L3815	M3820	S3821	Q3822	E3823	K3825	Y3828	S3830	P3831	P3832	R3833	A3834	P3835	P3836	C3837	E3838	Y3839	L3843	THR	LYS	MET	LYS	SER	GLY	HIS	D3851	T3867	S3870	F3871	R3872	K3873	R3874	E3875	P3879	A3880	D3881	L3882	L3883	K3884	R3885	R3889	L3898	R3899	L3898	R3901	I3911							
C3912	H3915	M4000	T4001	M4002	V4006	K4007	E4008	P4009	S4010	F4011	K4014	M4015	GLU	GLN	LYS	MET	LEU	LYS	LYS	GLY	GLY	SER	TRP	ILE	GLN	GLU	ILE	ASN	VAL	ALA	GLU	LYS	ASN	Q3966	F3967	I3968	N3969	L3970	M3974	K3975	A4052	G4053	A4054	M4055	I4059	A4073	F4074	R4075	D4076	G4083	S4084				
K4085	D4086	H4087	M4088	I4089	R4090	A4091	P4094	E4095	S4096	G4097	L4098	S4099	E4100	E4101	T4102	K4105	D4113	P4114	M4115	I4116	L4117	G4118	R4119	T4120	G39	W4121	E4122	G4123	W4124	L4125	P4126	M4127	M4128	L57	V58	D62	F63	L66	V67	K71	S72	L73	H74	S75	I76	F77	F78	R79	E80	C81	D168	R82	T169		
K87	F88	K173	C90	I91	S104	I107	K108	M109	T110	C111	T112	S113	V114	Y115	T116	K117	D118	R119	A120	A121	K122	I125	P126	A127	G39	L128	D129	L130	L131	V50	I132	K133	Q136	R139	R142	E146	I149	G150	E151	L152	F153	S154	K155	F156	Y157	G158	E159	L160	P167	D168	R82	T169			
V170	L171	E172	K173	Y174	I175	E176	L177	V184	H185	P186	M189	N195	L196	F197	R198	A199	F200	L201	E214	L217	L220	A221	G222	C223	L224	K225	G226	S228	I229	L230	S237	E240	Q243	T244	S245	R246	E247	I248	F249	R250	F251	V252	L253	LYS	ALA	ILE	ARG	PRO	Q259						

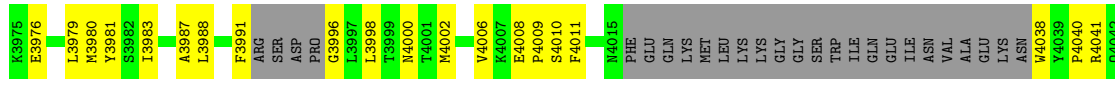
• Molecule 1: DNA-dependent protein kinase catalytic subunit



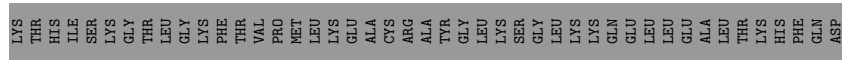
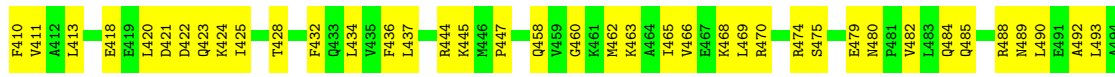
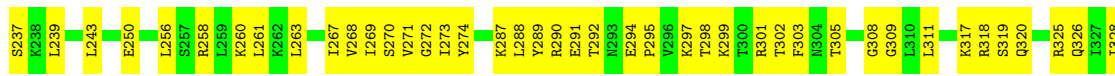
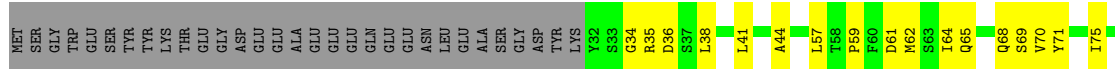
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K87	F88	K173	C90	I91	S104	I107	K108	M109	T110	C111	T112	S113	V114	Y115	T116	K117	D118	R119	A120	A121	K122	I125	P126	A127	G39	L128	D129	L130	L131	V50	I132	K133	Q136	R139	R142	E146	I149	G150	E151	L152	F153	S154	K155	F156	Y157	G158	E159	L160	P167	D168	R82	T169

H1385	H1386	V1389	Q1390	V1391	D1397	V1398	C1399	V1400	N1401	H1402	H1403	H1404	A1405	L1406	S1409	P1410	K1411	D1412	D1413	I1414	L1415	E1416	L1417	H1418	L1419	R1420	E1421	K1422	L1423	T1424	Q1425	D1444	R1445	S1446	R1447	L1448	V1452	L1458	H1459	R1460	N1466	L1467	P1469	D1474	V1479	L1483	L1484																		
H1304	D1305	I1306	I1307	C1312	F1313	GLY	E1332	GLY	E1333	ALA	GLY	ASN	ARG	T1322	E1326	R1329	Y1330	N1331	Y1332	S1333	K1334	V1337	V1338	L1339	R1340	I1341	M1342	E1343	S1352	W1356	K1357	L1358	K1359	K1361	H1367	L1368	M1369	R1370	V1371	L1372	V1373	Q1374	L1375	P1376	C1377	E1378	P1379	V1382	G1383	F1384															
K1213	F1219	L1220	I1221	E1225	Q1231	P1232	S1233	G1234	I1235	L1236	T1240	LEU	LEU	TYR	LEU	ARG	GLY	PRO	PHE	S1249	I1253	L1254	C1255	L1256	L1257	D1258	L1259	L1260	L1261	A1262	E1265	G1266	Y1267	T1275	A1278	L1279	Q1280	V1281	L1282	G1283	T1284	A1293	F1296	F1297	L1298	E1299	S1300	I1301	L1212																
I1181	D1182	H1183	L1184	C1185	R1186	I1187	I1188	I1189	E1139	K1140	N1146	R1152	L1153	P1154	R1155	C1164	L1165	L1166	D1167	L1168	V1169	K1170	W1171	L1172	A1173	L1174	L1175	C1176	G1177	E1182	C1183	R1184	S1187	L1190	F1191	Y1192	K1193	F1194	V1195	P1196	L1197	L1198	P1199	G1200	R1201	R1202	M1205	K1209	D1210	V1211	L1212														
Q1048	K1051	N1055	T1056	K1057	S1058	R1062	L1063	Y1064	S1065	H1069	L1075	L1076	G1077	A1078	S1079	L1080	A1081	F1082	I1085	F1096	L1098	R1099	E1011	A1012	L1013	L1014	D1015	Q1098	F1099	V1100	F1101	E1102	A1103	L1104	V1105	I1106	Y1107	M1108	E1109	H1115	A1116	D1117	E1118	L1121	G1122	T1123	L1124	Q1125	Q1126	C1127	C1128														
T965	F966	L972	A973	C974	D975	V976	D977	Q978	V979	T980	R981	Q982	R913	V914	E985	T915	E916	L917	A918	L919	T920	R854	A921	S922	D923	E924	Q925	T926	K927	V928	E932	L933	L934	H935	F936	M937	V938	M939	F940	M941	L942	G943	K944	A945	T946	Q947	C952	A955	P956	R957	M958	Y959	Q960	L961	Y962	K963	R964								
K832	H833	L834	K835	K838	M839	L840	SER	SER	ASN	GLU	ALA	ILE	S847	L848	D849	E850	R851	R852	M853	Q854	P855	M858	L859	G860	S861	L862	C863	G864	Q865	R866	N867	L868	M869	ALA	LEU	SER	ASP	GLU	M879	M880	K881	S882	Y883	D887	R888	E889	R890	R891	L892	S893	F894	A895													
G759	L760	S761	T763	I764	L765	A766	E767	V768	G769	L770	W776	T780	D781	R782	H783	V784	M785	Q786	P787	Y788	Y789	K790	D791	T792	L793	G798	K801	T802	S803	ALA	LEU	SER	ASP	GLU	THR	VAL	THR	SER	ASN	ASP	GLU	M879	M880	K881	S882	Y883	D887	R888	E889	R890	R891	L892	S893	F894	A895										
R675	K678	K679	I680	K681	V682	G685	SER	VAL	SER	PRD	LYS	SER	LEU	LYS	HIS	SER	SER	GLY	K700	S702	C703	L706	F707	E636	F708	K709	F710	E713	W714	E643	P644	W645	L726	A727	S728	C729	F732	L733	L734	S735	L736	P737	H738	N739	I740	F666	G667	K668	L669	L670	S671	L672	L758												
Y524	K525	D526	Y527	D528	P529	L530	F531	R532	H533	L534	S537	M540	M541	D542	S543	I544	D547	GLU	ALA	PHE	SER	VAL	ASN	P635	SER	SER	E640	F641	E643	P644	W645	F649	S650	Y651	E652	L653	L654	E584	I685	Q686	L662	T663	S664	G665	GLU	GLN	F666	G667	K668	L669	L670	S671	L672	L758											
F446	P447	Q448	Y449	S450	K451	K452	M453	Q454	L455	A460	I461	A462	K463	Y385	V386	E387	L388	V389	Q390	R391	N477	C478	I479	V482	G486	R489	I490	ASP	C491	S492	K493	P498	LYS	GLY	PRO	GLU	L573	L574	K574	L414	Q415	S416	V417	V420	HIS	ARG	ALA	SER	GLY	GLU	VAL	E429	V430	ASN	Y431	T432	VAL	ASP	P433	ASP	SER	ASN	K356	L357	E358
I260	D261	Y265	A270	L274	F275	H278	Q281	L286	F294	E295	V296	L297	L298	K299	W300	C301	A302	H303	T304	N305	L308	K309	S314	A315	L316	E317	S318	F319	L320	V323	M326	V327	N330	Q344	I348	I349	ARG	ASN	VAL	VAL	P434	ASP	SER	ASN	K356	L357	E358																		

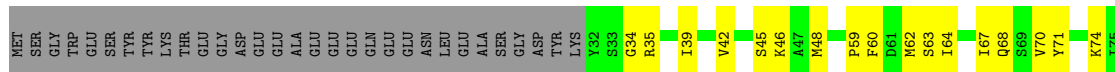
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R374	K3771	D3661	L3575	L3468	H3384	L3273	P3034	R2922	K2829	G2747	LEU	ARG
K3877	G3772	M3664	L3578	L3472	V3389	W3277	F3035	W2923	N2830	V2748	PHE	THR
R3889	L3774	M3665	L3579	R3474	V3393	R3276	F3036	V2924	N2831	A2749	ALA	GLN
S3893	L3775	L3666	S3579	R3475	E3393	W3277	Q3037	E2925	I2832	O2750	HIS	GLY
P3894	D3778	K3669	K3580	Y3475	E3394	R3282	E3038	A2927	Q2834	K2751	ARG	GLY
E3895	C3781	K3675	P3581	T3479	A3395	L3283	L3041	L2929	K2835	K2752	SER	LEU
A3896	A3785	V3588	E3582	L3480	GLN	R3287	M3044	R2930	F2847	E2756	GLU	SER
F3897	P3676	V3589	A3589	L3480	PRO	Q3291	S3047	R2931	T2848	I2757	ARG	ALA
L3898	L3788	K3676	K3590	M3483	SER	Q3291	K3048	Y2936	F2853	E2760	TRP	TRP
R3901	R3789	D3591	D3591	I3487	TRP	T3299	K3049	D2937	F2854	L2761	VAL	VAL
A3909	V3793	V3592	V3592	I3487	SER	V3300	K3050	V2938	C2857	K2764	ALA	ALA
C3912	K3796	K3681	K3593	V3490	CYS	L3301	L3051	L2939	C2857	K2764	LEU	GLY
I3913	G3801	P3685	L3596	M3493	GLY	K3302	L3052	R2940	D2860	Q2765	LYS	GLN
H3915	L3802	W3686	L3597	I3496	PRO	T3303	T3063	G2941	D2860	Q2765	SER	ILE
H3915	I3803	M3687	L3597	I3496	ALA	V3304	F3064	I2942	C2863	V2769	VAL	ARG
I3920	E3804	G3707	V3601	I3499	ALA	V3304	I3065	I2944	Q2864	R2773	GLY	ALA
H3924	G3805	P3684	N3602	M3502	A3407	S3313	Q3059	T2944	Q2864	R2773	PRO	THR
L3925	L3806	S3688	K3603	L3506	F3419	S3313	L3135	T2944	H2865	R2773	ASP	GLN
N3926	T3809	P3713	L3606	L3506	S3314	S3313	T3136	L2957	A2866	R2776	ASP	GLN
M3929	V3810	E3714	I3606	D3509	C3420	Y3315	E3137	K2950	L2866	R2776	PHE	GLN
V3930	V3811	R3718	M3613	D3509	I3410	L3316	I3138	Q2951	A2867	H2777	GLY	GLN
T3934	R3719	R3718	V3614	V3512	Y3413	S3317	Q3139	I2952	L2868	G2778	LYS	GLN
V3937	A3720	A3720	V3614	H3516	M3414	K3318	E3140	T2953	L2869	D2779	LYS	ASP
I3938	L3617	L3617	L3618	H3516	F3419	R3324	I3065	Q2954	Q2886	L2780	ARG	PHE
G3939	E3724	E3724	D3619	I3521	C3420	R3328	I3066	Y2985	R2891	L2780	LEU	THR
I3940	V3726	V3726	P3620	I3521	I3410	I3328	L3078	S2986	L2892	S2788	GLY	THR
D3941	T3727	T3727	K3621	Y3525	SER	ALA	K3075	E2967	L2892	H2787	GLY	THR
A3949	V3728	V3728	A3622	V3530	VAL	C3347	M3069	P2986	L2893	L2783	LEU	THR
P3956	M3729	M3729	F3628	V3530	ILE	C3347	M3069	P2986	E2894	I2791	PRO	GLN
E3957	A3730	A3730	R3628	S3539	ASP	I3351	L3088	A2989	L2897	I2792	GLY	THR
L3958	R3734	R3734	R3629	T3539	SER	I3351	L3088	A2989	L2899	Q2795	ALA	ALA
F3961	P3735	P3735	K3630	SER	ALA	D3354	L3089	E2990	R2899	Q2795	ALA	ALA
R3962	K3736	K3736	X3631	PHE	LEU	R3357	L3091	K2991	L2900	D2801	ALA	THR
L3963	K3736	K3736	F3632	LYS	GLN	R3358	L3092	W2994	L2901	F2802	GLY	GLY
R3964	R3741	R3741	Q3634	L3359	ALA	I3359	D3095	L2989	PRO	L2803	SER	SER
R3965	G3742	G3742	Q3634	L3360	ALA	L3360	D3096	D3000	ALA	L2803	THR	THR
F3966	H3743	H3743	F3640	ASP	P3443	S3261	V3097	H3004	GLU	L2804	THR	THR
F3967	D3744	D3744	F3640	S3546	V3446	L3362	R3098	L3005	LEU	A2805	ASP	ASP
L3968	E3745	E3745	G3647	T3547	V3446	L3363	A3099	C3014	PRO	Q2807	LEU	LEU
M3969	R3746	R3746	GLY	K3550	R3449	L3259	K3100	S3014	LYS	L2817	VAL	VAL
N3970	E3747	E3747	SER	N3551	M3450	R3260	R3100	S3015	ARG	L2817	ARG	ARG
M3971	F3750	F3750	LYS	SER	M3450	E3261	Y3101	E3022	VAL	E2819	VAL	HIS
L3972	F3751	F3751	F3554	SER	A3453	L3262	Y3102	ASN	ARG	K2818	ARG	THR
P3973	T3867	T3867	V3555	F3368	A3454	H3263	I3103	GLY	GLY	Q2736	GLY	SER
M3974	V3752	V3752	V3559	D3369	K3455	H3263	I3104	PRO	ALA	E2737	PRO	PRO
S3870	L3767	L3767	K3559	K3372	K3455	S3266	N3105	PRO	ALA	F2823	ALA	SER
			V3372	V3372	A3461	R3268	G3106	ASP	ARG	T2825	ASP	ASP
			L3562	L3562	R3462	R3269	F3110	ASN	LEU	L2741	ASP	SER

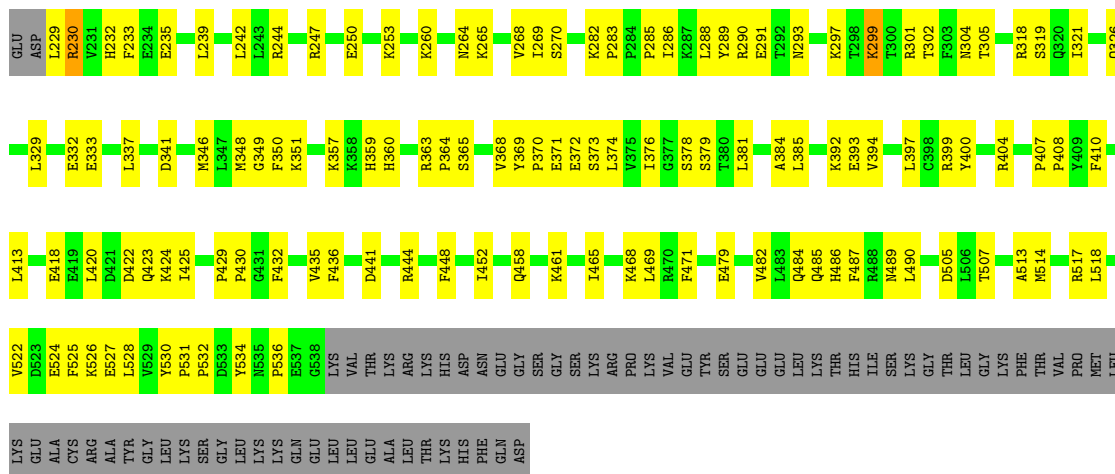


• Molecule 2: X-ray repair cross-complementing protein 6

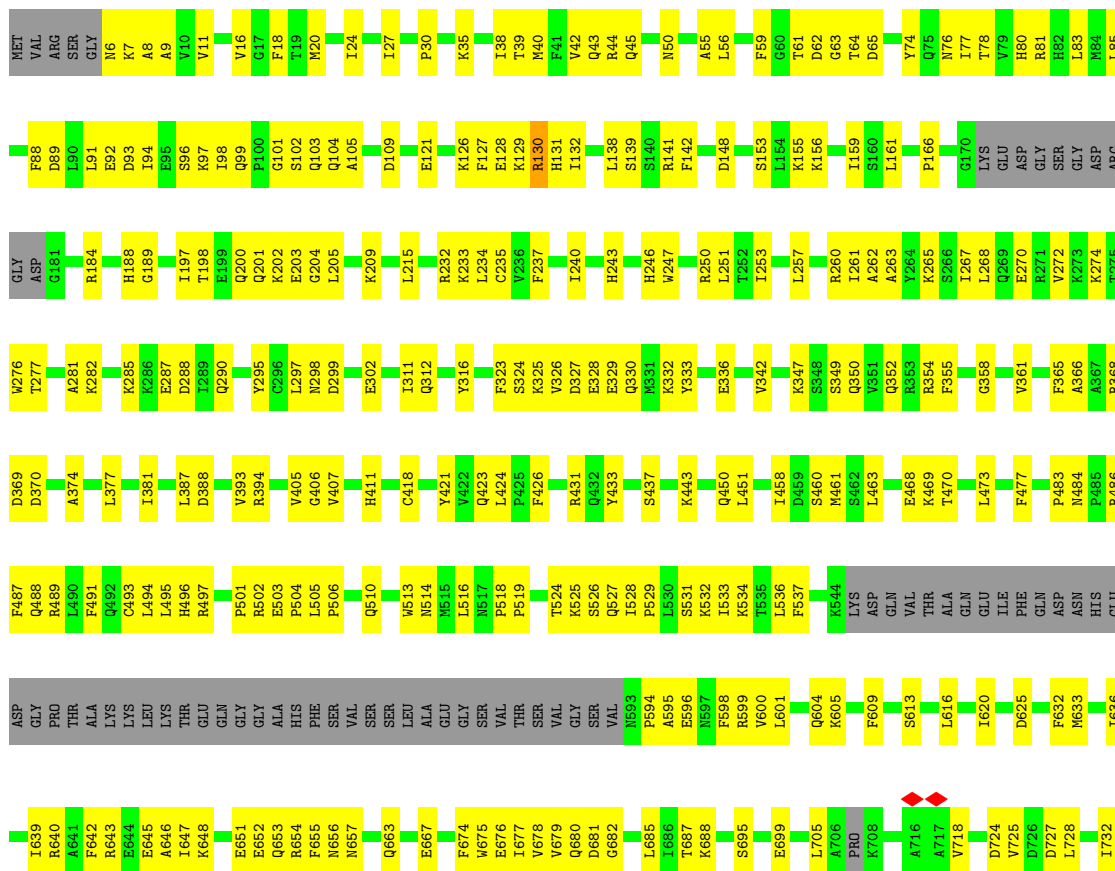


• Molecule 2: X-ray repair cross-complementing protein 6

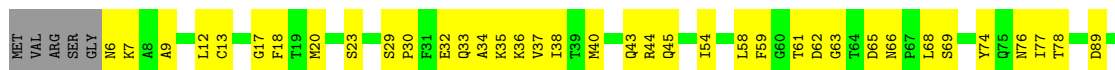


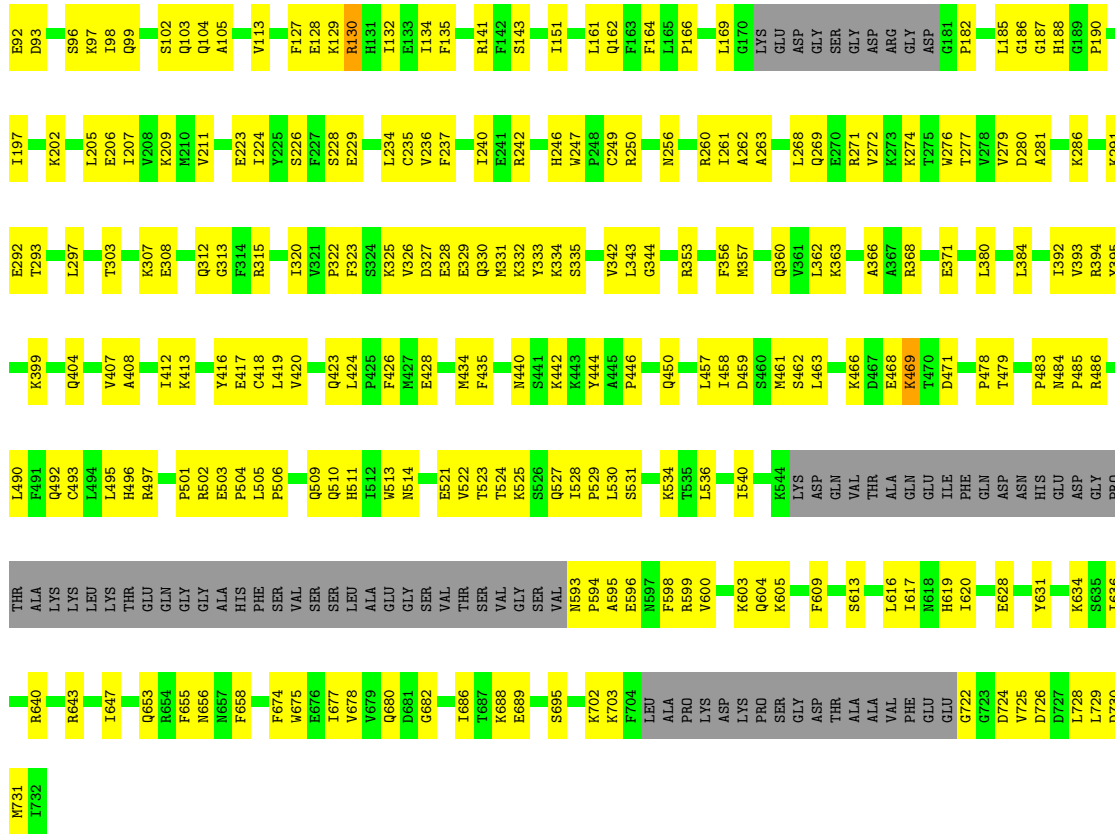


• Molecule 3: X-ray repair cross-complementing protein 5

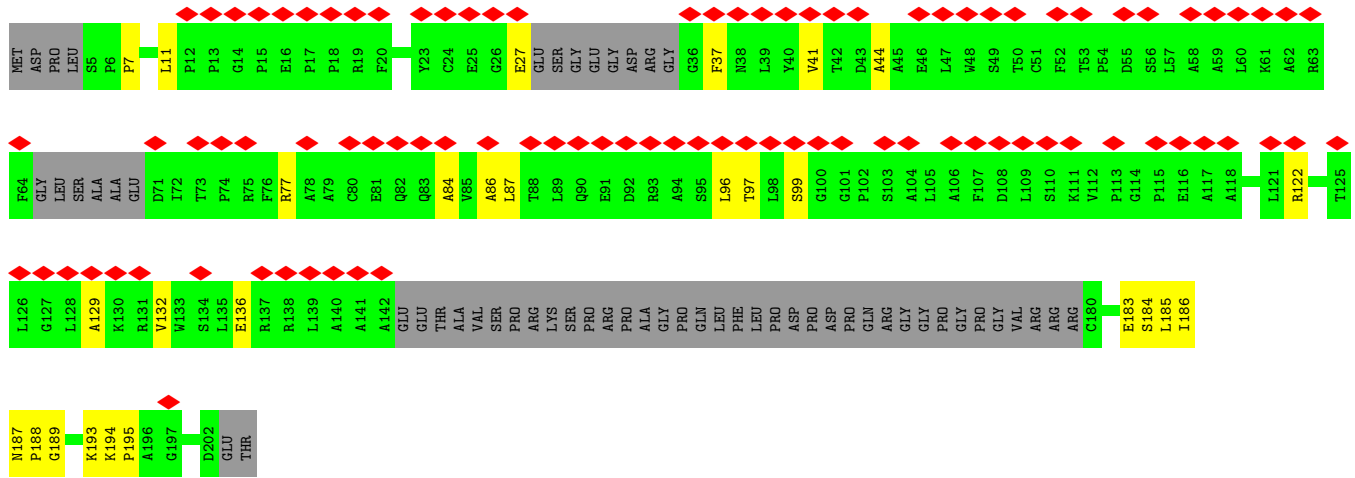


• Molecule 3: X-ray repair cross-complementing protein 5

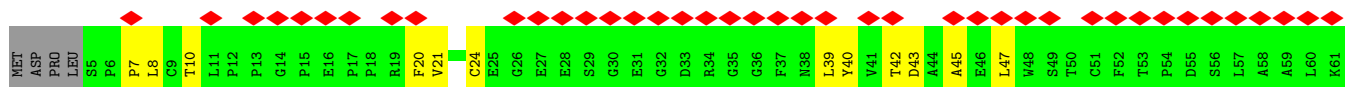


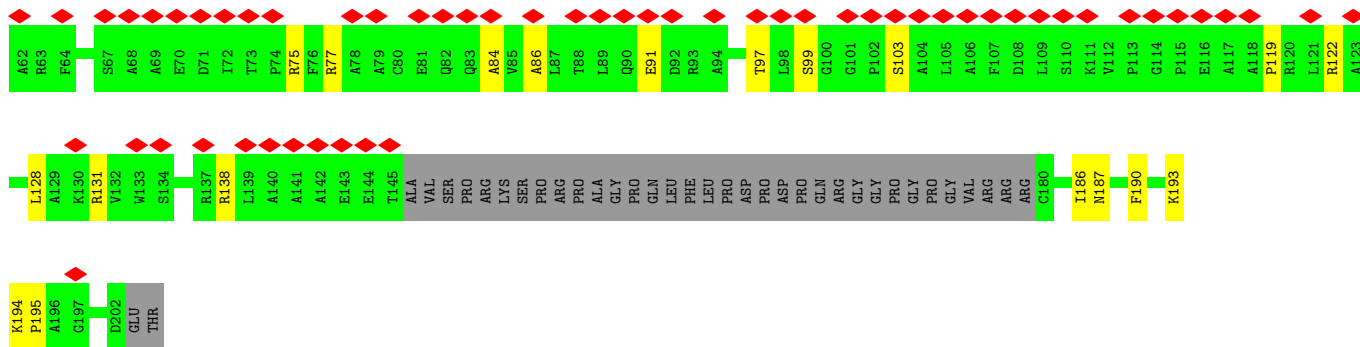


● Molecule 4: Protein PAXX

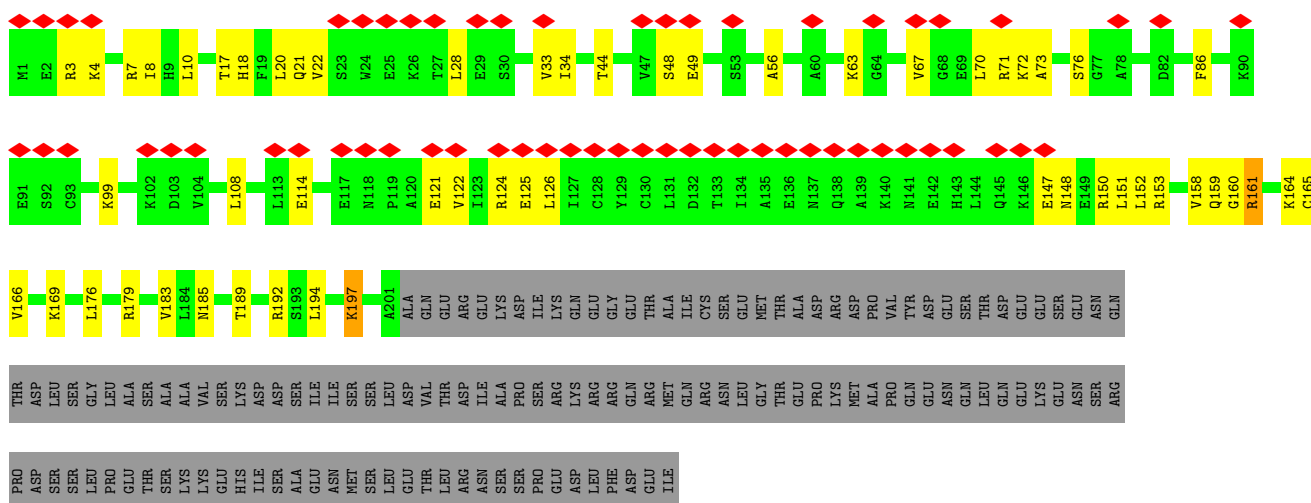
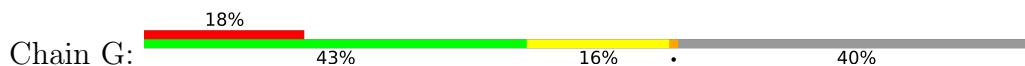


● Molecule 4: Protein PAXX

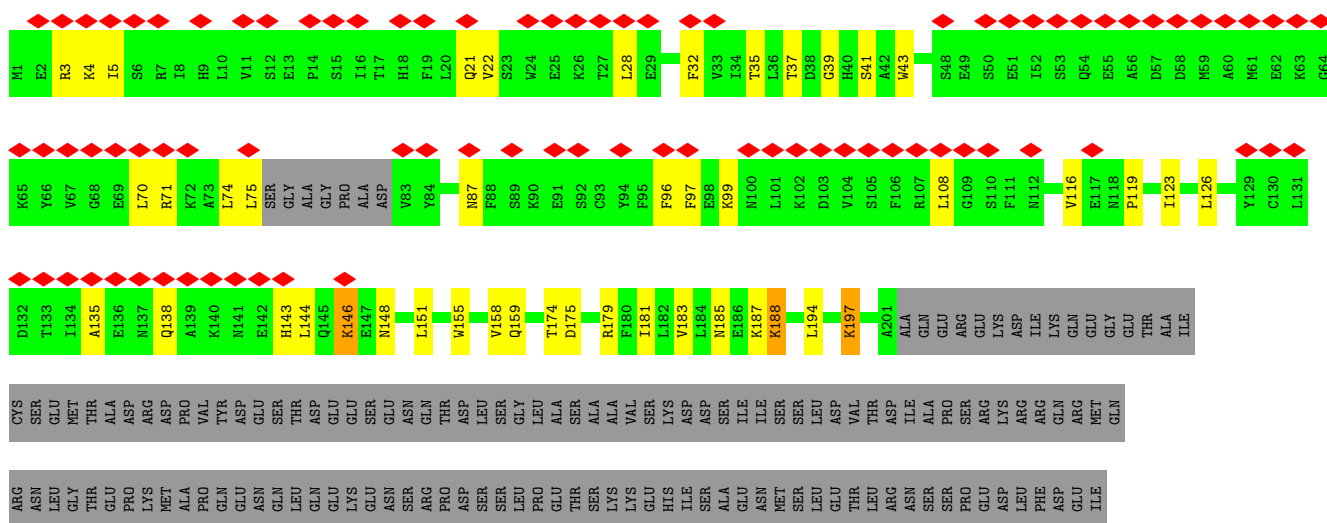
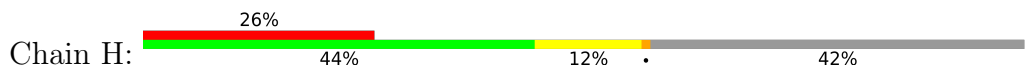


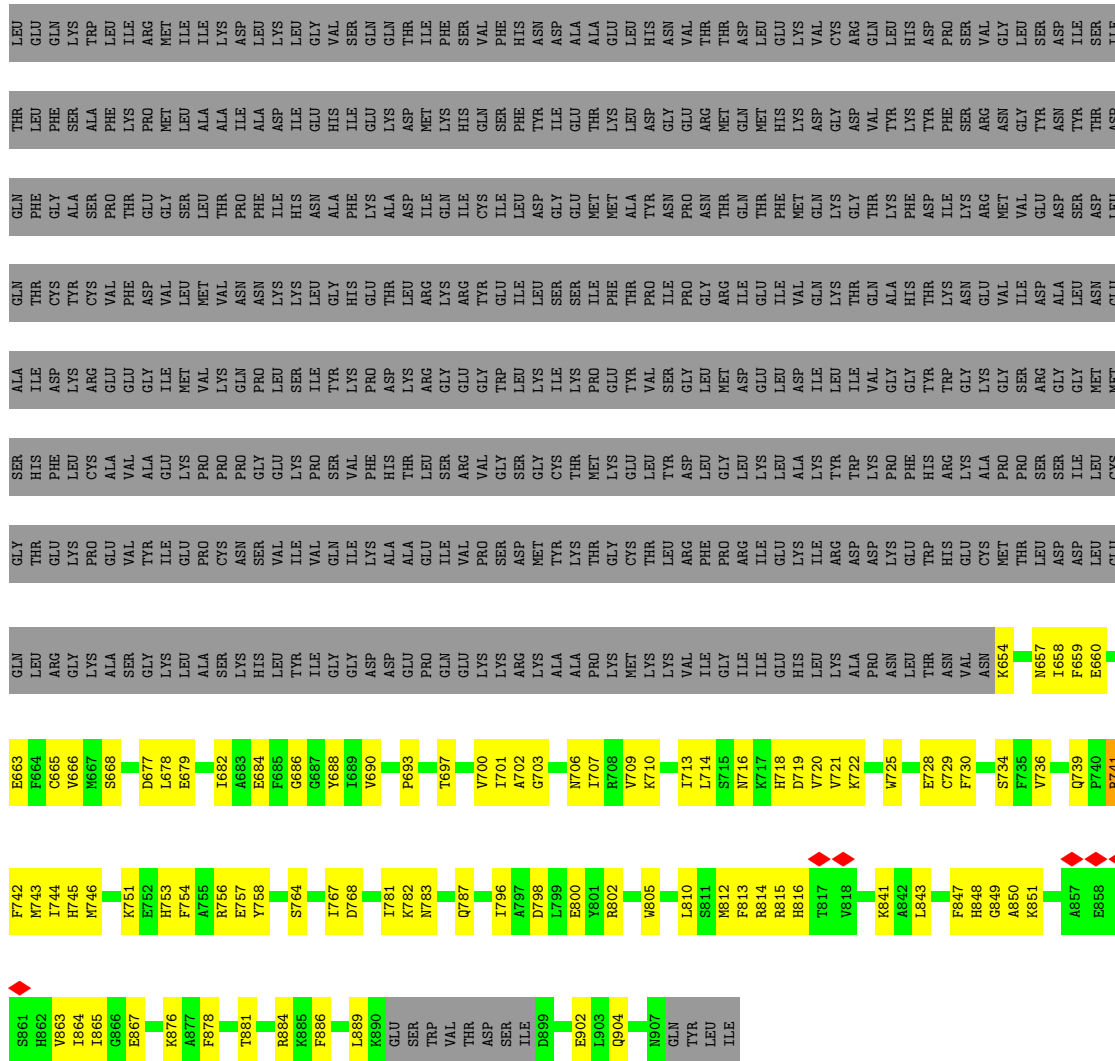


• Molecule 5: DNA repair protein XRCC4

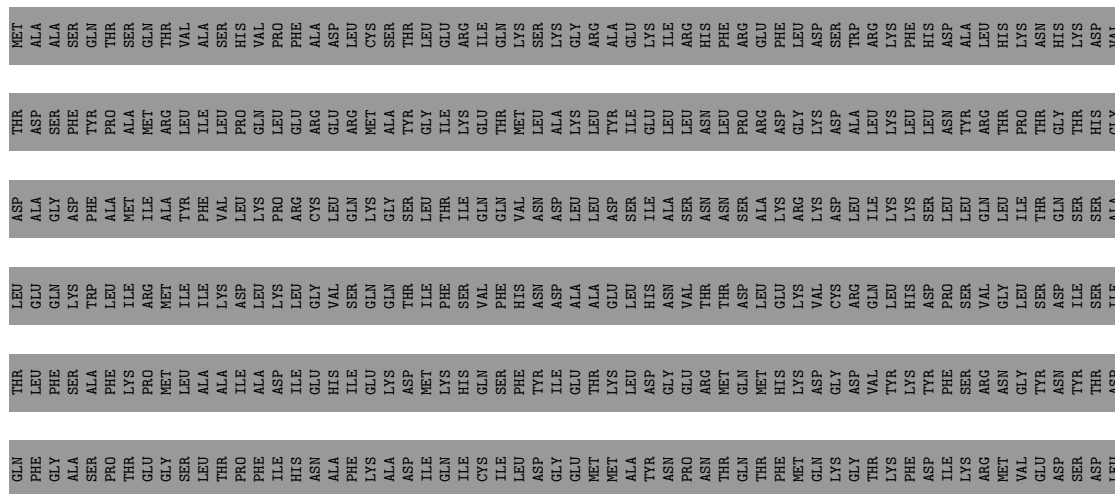


• Molecule 5: DNA repair protein XRCC4





• Molecule 6: DNA ligase 4



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	35211	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	52.1	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	130000	Depositor
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.940	Depositor
Minimum map value	-0.499	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.024	Depositor
Recommended contour level	0.061	Depositor
Map size (\AA)	704.16003, 704.16003, 704.16003	wwPDB
Map dimensions	540, 540, 540	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (\AA)	1.304, 1.304, 1.304	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	A	0.27	0/28471	0.50	0/38509
1	S	0.26	0/28549	0.49	0/38591
2	B	0.27	0/4118	0.50	0/5556
2	T	0.26	0/4092	0.50	0/5516
3	C	0.25	0/5393	0.46	0/7273
3	L	0.25	0/5272	0.47	0/7107
4	D	0.25	0/1101	0.47	0/1500
4	M	0.27	0/1223	0.51	0/1665
5	G	0.24	0/1657	0.47	0/2228
5	H	0.24	0/1616	0.45	0/2170
5	P	0.24	0/1657	0.46	0/2228
5	Q	0.24	0/1616	0.45	0/2170
6	I	0.25	0/2021	0.49	0/2727
6	R	0.24	0/1999	0.49	0/2697
7	j	0.53	0/570	1.03	0/876
8	i	0.60	0/620	0.99	0/953
9	d	0.63	0/591	1.05	1/908 (0.1%)
10	e	0.56	0/644	0.96	1/990 (0.1%)
All	All	0.27	0/91210	0.51	2/123664 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
10	e	39	DA	O4'-C4'-C3'	-5.48	102.31	104.50
9	d	19	DA	O4'-C4'-C3'	-5.10	102.46	104.50

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	27927	0	27803	1226	0
1	S	27999	0	28062	1170	0
2	B	4038	0	4071	210	0
2	T	4014	0	4065	180	0
3	C	5292	0	5264	222	0
3	L	5174	0	5164	215	0
4	D	1075	0	1060	20	0
4	M	1195	0	1157	21	0
5	G	1628	0	1620	45	0
5	H	1589	0	1587	35	0
5	P	1628	0	1620	22	0
5	Q	1589	0	1587	23	0
6	I	1977	0	1923	91	0
6	R	1958	0	1905	72	0
7	j	509	0	271	0	0
8	i	552	0	301	0	0
9	d	528	0	282	0	0
10	e	573	0	312	0	0
All	All	89245	0	88054	3398	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 20.

The worst 5 of 3398 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
6:R:814:ARG:H	6:R:850:ALA:H	1.08	0.95
2:T:318:ARG:HB2	2:T:329:LEU:O	1.68	0.94
1:A:174:VAL:O	1:A:177:LEU:HB2	1.69	0.92
2:T:400:TYR:O	2:T:408:PRO:HA	1.68	0.92
1:A:67:VAL:HB	1:A:85:ILE:HD13	1.54	0.89

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	3476/4128 (84%)	3213 (92%)	259 (8%)	4 (0%)	51	85
1	S	3464/4128 (84%)	3210 (93%)	252 (7%)	2 (0%)	51	85
2	B	505/609 (83%)	471 (93%)	34 (7%)	0	100	100
2	T	498/609 (82%)	470 (94%)	28 (6%)	0	100	100
3	C	660/732 (90%)	619 (94%)	41 (6%)	0	100	100
3	L	644/732 (88%)	615 (96%)	29 (4%)	0	100	100
4	D	139/204 (68%)	137 (99%)	2 (1%)	0	100	100
4	M	160/204 (78%)	160 (100%)	0	0	100	100
5	G	199/336 (59%)	195 (98%)	4 (2%)	0	100	100
5	H	190/336 (56%)	188 (99%)	2 (1%)	0	100	100
5	P	199/336 (59%)	196 (98%)	3 (2%)	0	100	100
5	Q	190/336 (56%)	188 (99%)	2 (1%)	0	100	100
6	I	242/911 (27%)	219 (90%)	23 (10%)	0	100	100
6	R	242/911 (27%)	216 (89%)	26 (11%)	0	100	100
All	All	10808/14512 (74%)	10097 (93%)	705 (6%)	6 (0%)	54	85

5 of 6 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	72	SER
1	S	3304	VAL
1	A	68	PHE
1	A	1231	GLN
1	A	66	LEU

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	2999/3671 (82%)	2984 (100%)	15 (0%)	88	93
1	S	3045/3671 (83%)	3030 (100%)	15 (0%)	88	93
2	B	443/548 (81%)	441 (100%)	2 (0%)	88	93
2	T	446/548 (81%)	441 (99%)	5 (1%)	73	85
3	C	581/649 (90%)	579 (100%)	2 (0%)	92	95
3	L	570/649 (88%)	566 (99%)	4 (1%)	84	90
4	D	110/160 (69%)	109 (99%)	1 (1%)	78	87
4	M	120/160 (75%)	118 (98%)	2 (2%)	60	78
5	G	180/303 (59%)	177 (98%)	3 (2%)	60	78
5	H	177/303 (58%)	174 (98%)	3 (2%)	60	78
5	P	180/303 (59%)	180 (100%)	0	100	100
5	Q	177/303 (58%)	176 (99%)	1 (1%)	86	92
6	I	218/808 (27%)	217 (100%)	1 (0%)	88	93
6	R	217/808 (27%)	214 (99%)	3 (1%)	67	81
All	All	9463/12884 (73%)	9406 (99%)	57 (1%)	86	92

5 of 57 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	L	469	LYS
2	T	297	LYS
6	R	782	LYS
2	T	230	ARG
1	S	3621	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 48 such sidechains are listed below:

Mol	Chain	Res	Type
6	I	904	GLN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	S	561	ASN
3	L	188	HIS
1	S	33	GLN
1	S	865	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

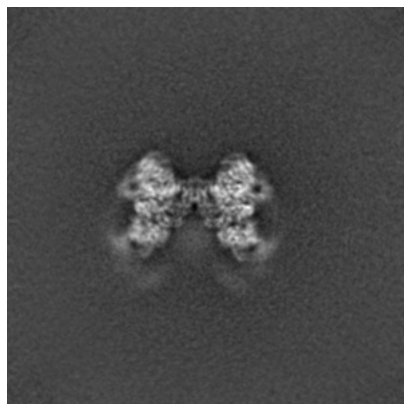
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-16044. These allow visual inspection of the internal detail of the map and identification of artifacts.

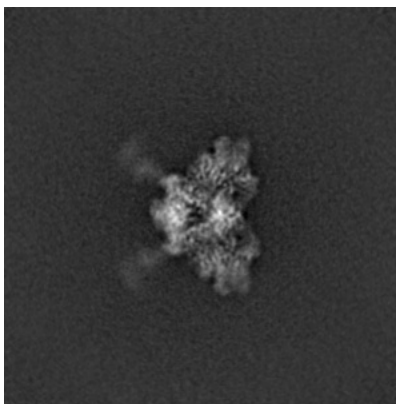
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

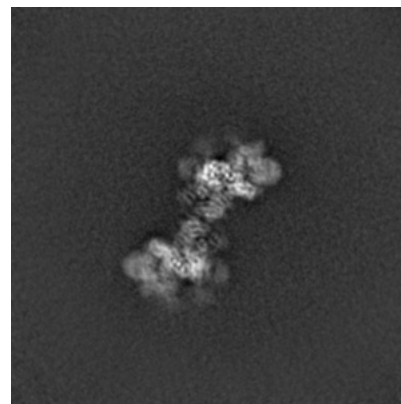
6.1.1 Primary map



X

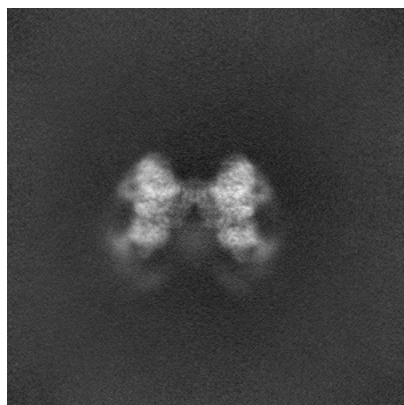


Y

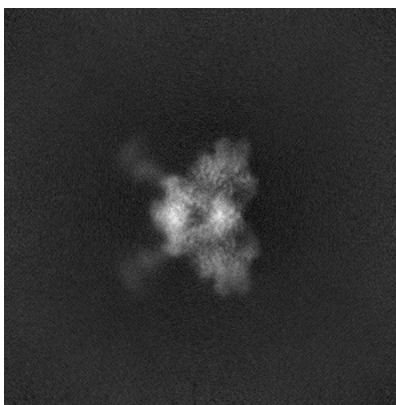


Z

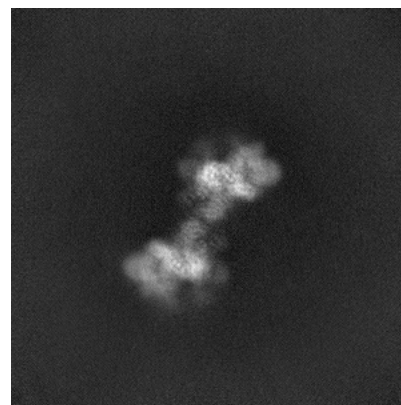
6.1.2 Raw map



X



Y

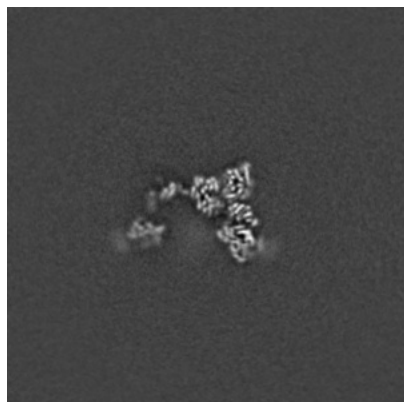


Z

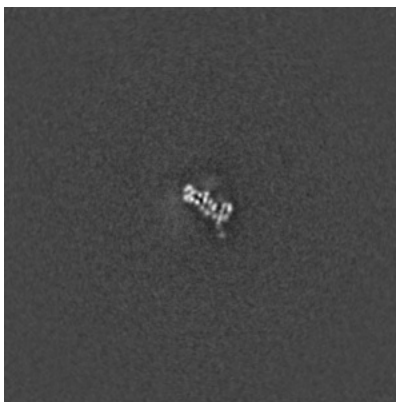
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

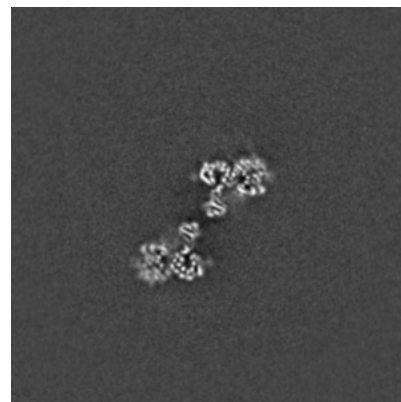
6.2.1 Primary map



X Index: 270



Y Index: 270

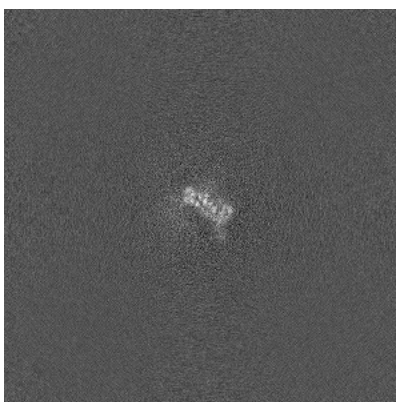


Z Index: 270

6.2.2 Raw map



X Index: 270



Y Index: 270

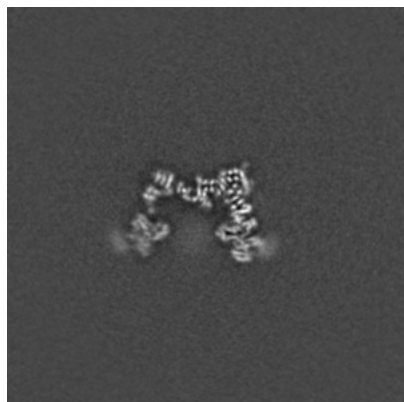


Z Index: 270

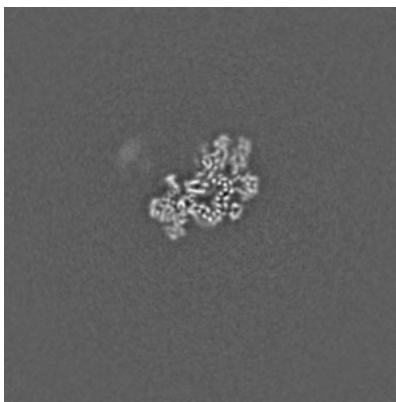
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

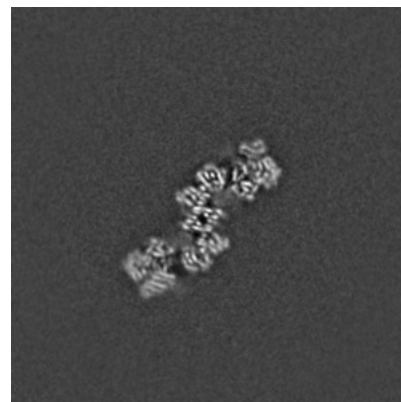
6.3.1 Primary map



X Index: 263

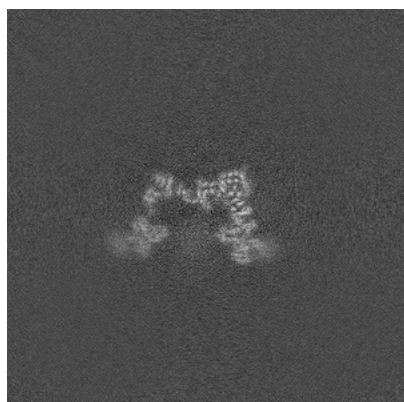


Y Index: 312

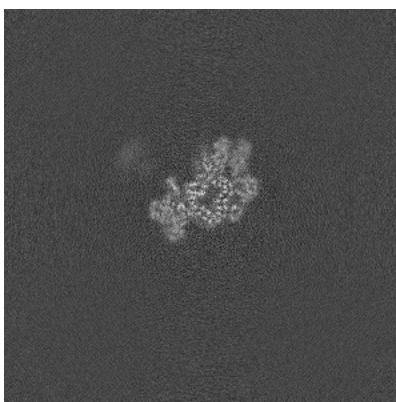


Z Index: 289

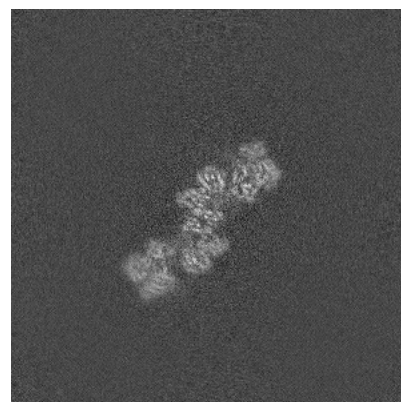
6.3.2 Raw map



X Index: 263



Y Index: 313

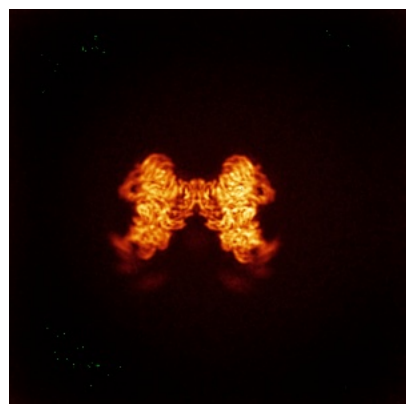


Z Index: 289

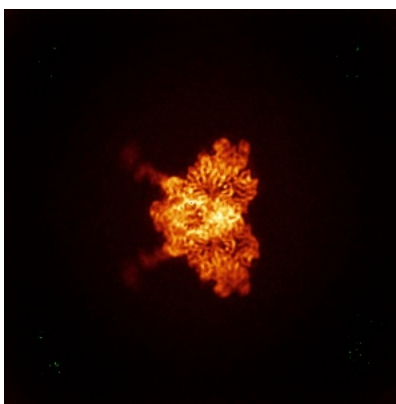
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) [i](#)

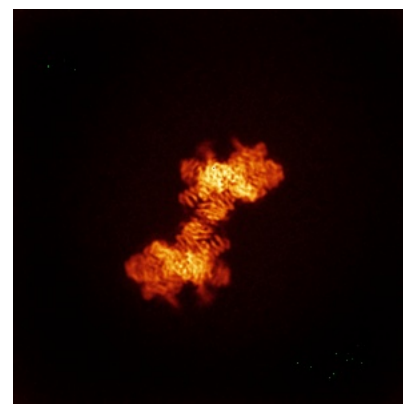
6.4.1 Primary map



X

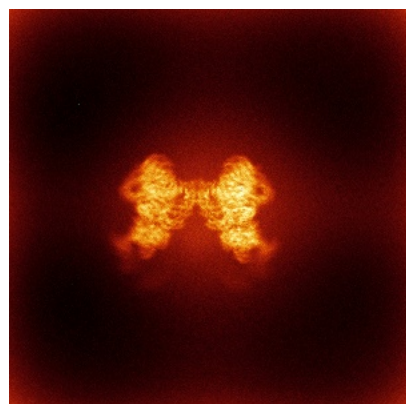


Y

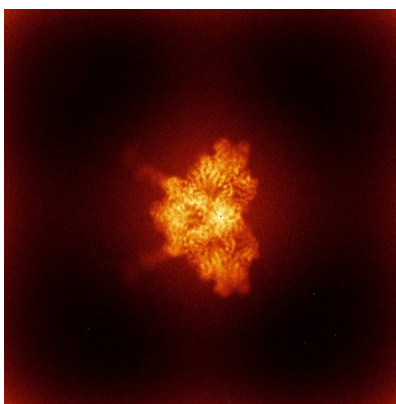


Z

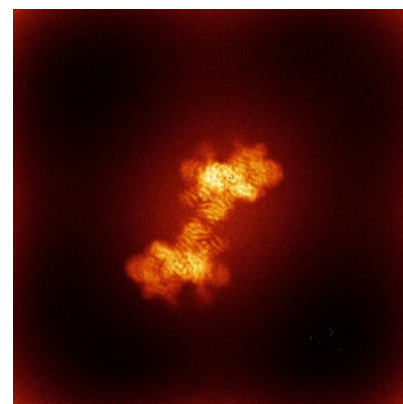
6.4.2 Raw map



X



Y



Z

The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



X



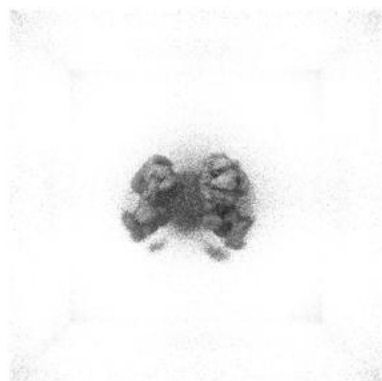
Y



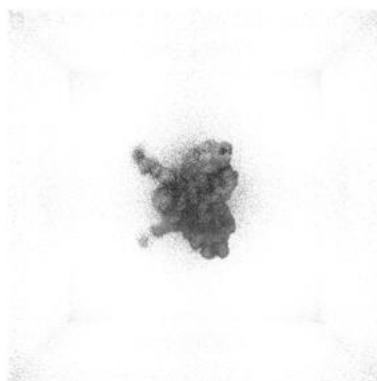
Z

The images above show the 3D surface view of the map at the recommended contour level 0.061. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

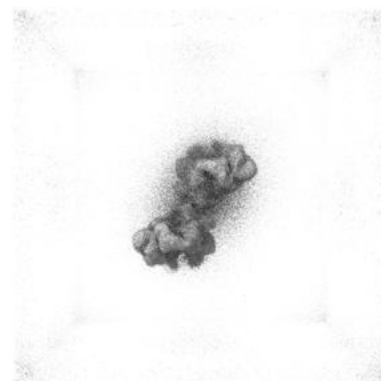
6.5.2 Raw map



X



Y



Z

These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

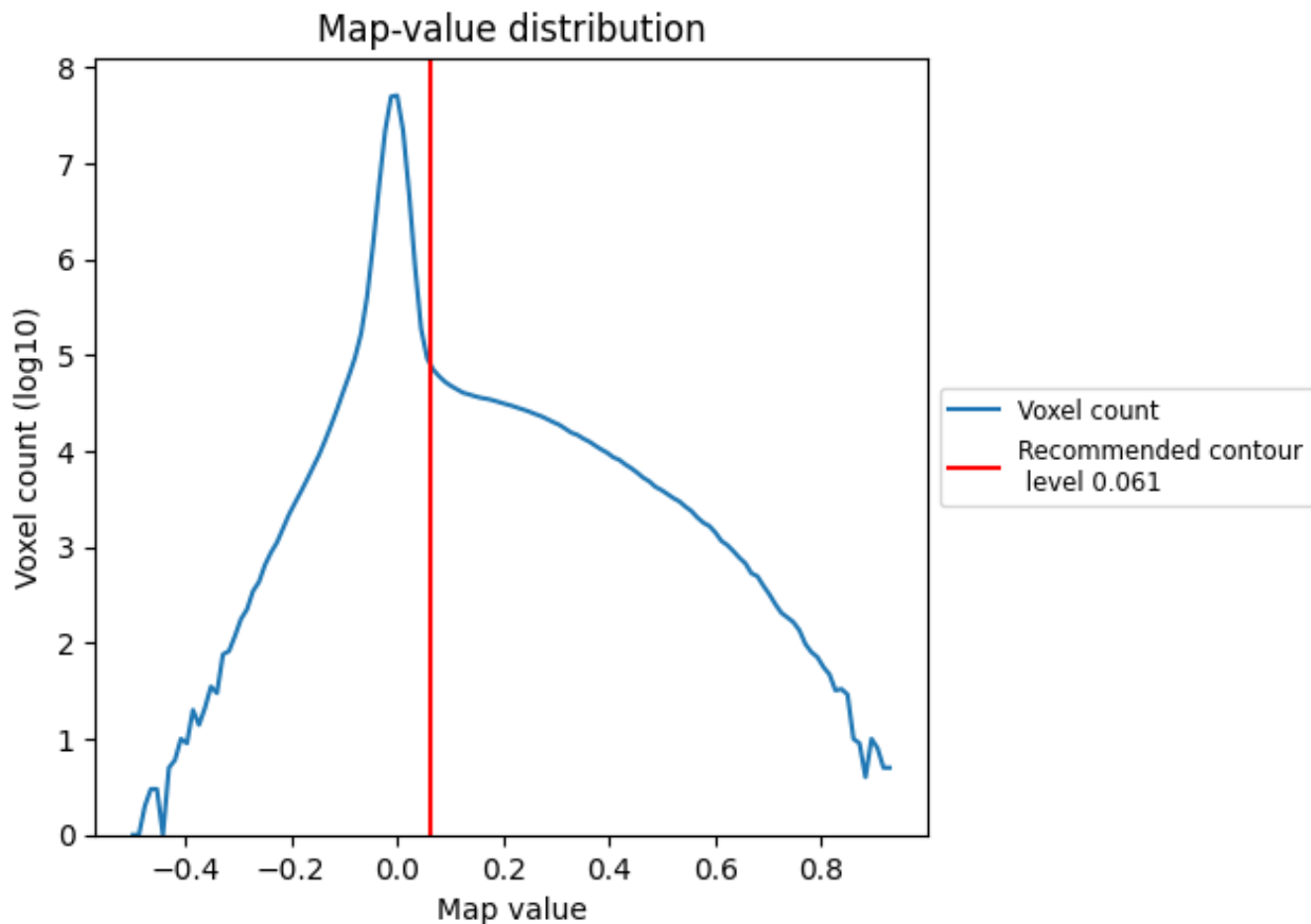
6.6 Mask visualisation [i](#)

This section was not generated. No masks/segmentation were deposited.

7 Map analysis [i](#)

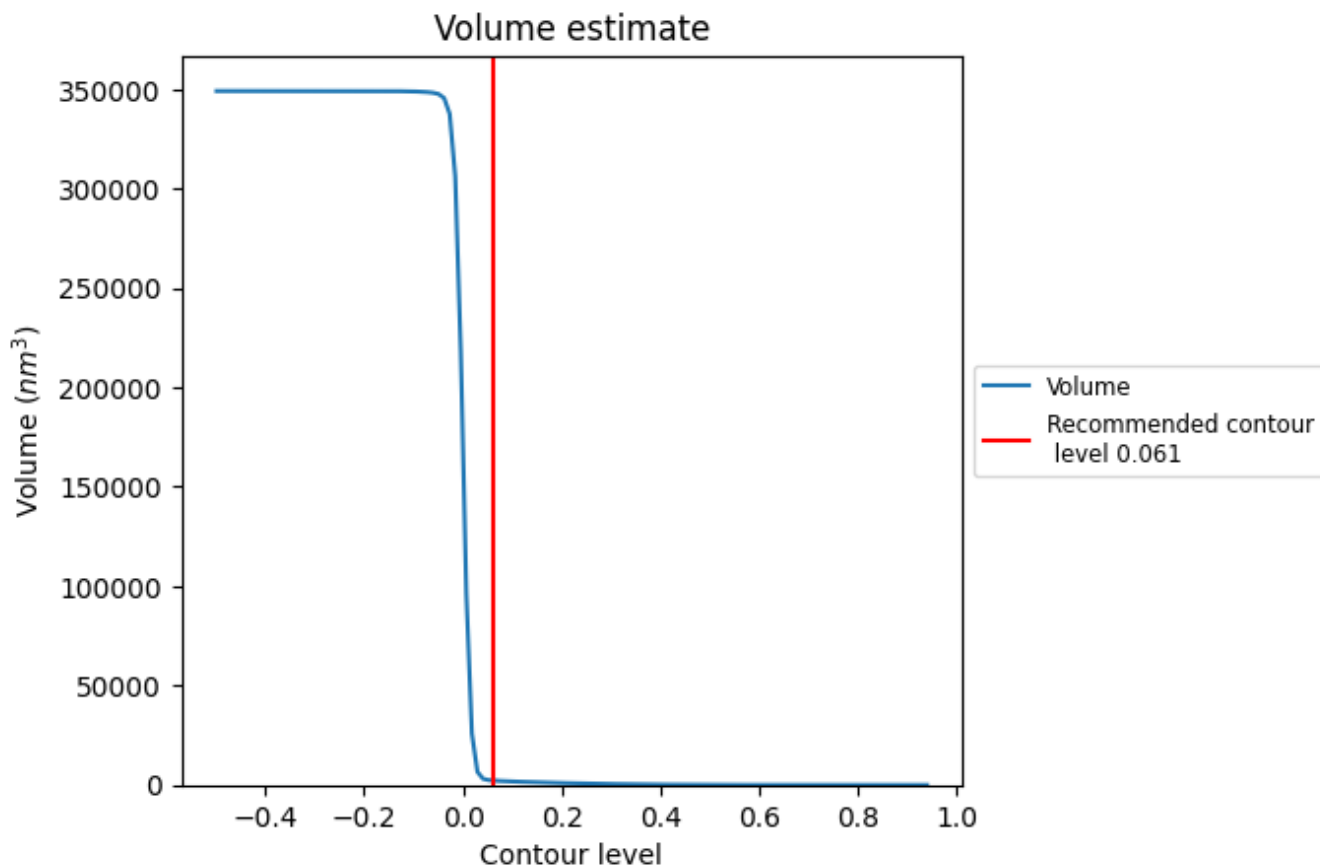
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

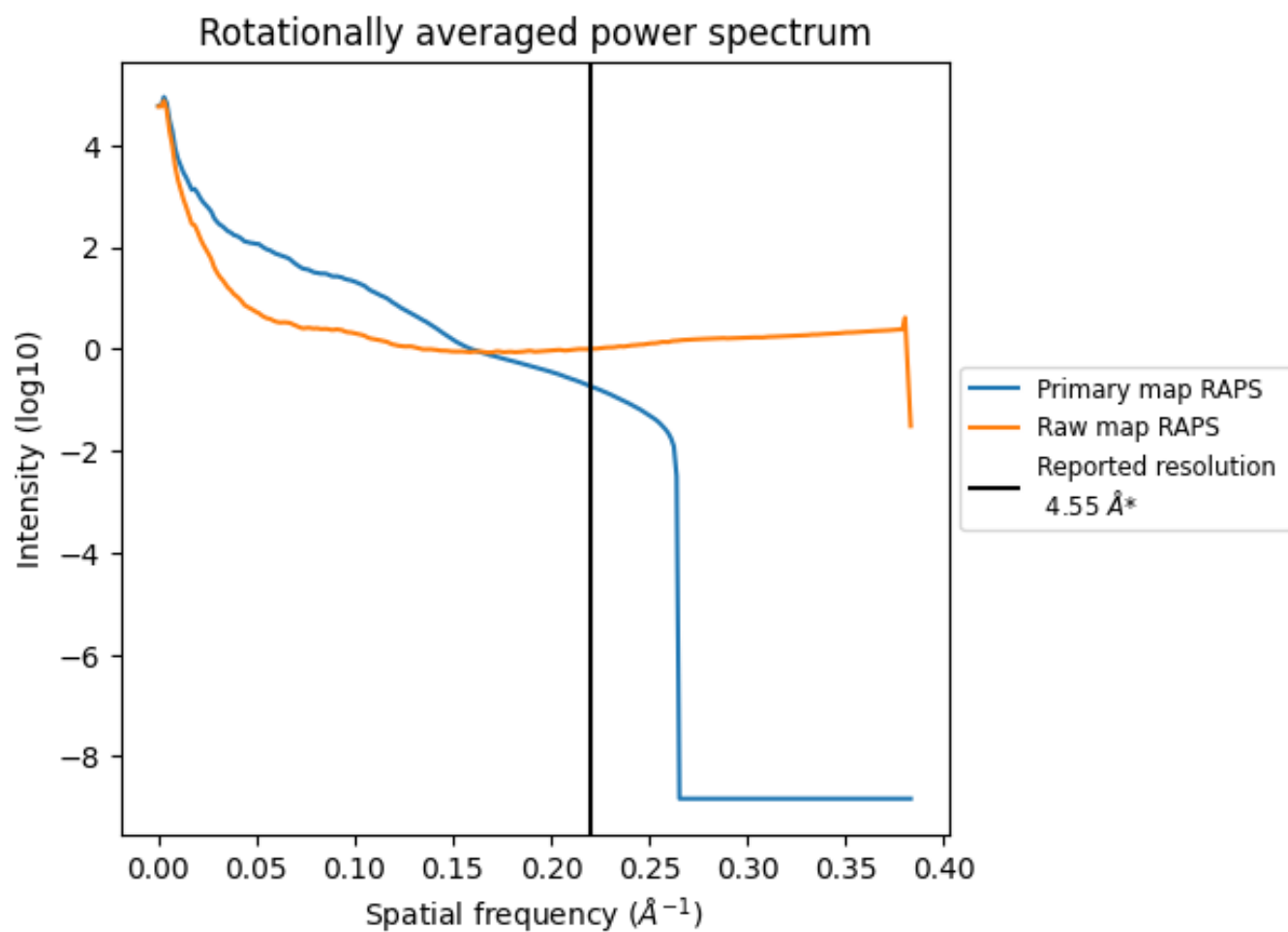
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 2251 nm³; this corresponds to an approximate mass of 2033 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

7.3 Rotationally averaged power spectrum [i](#)

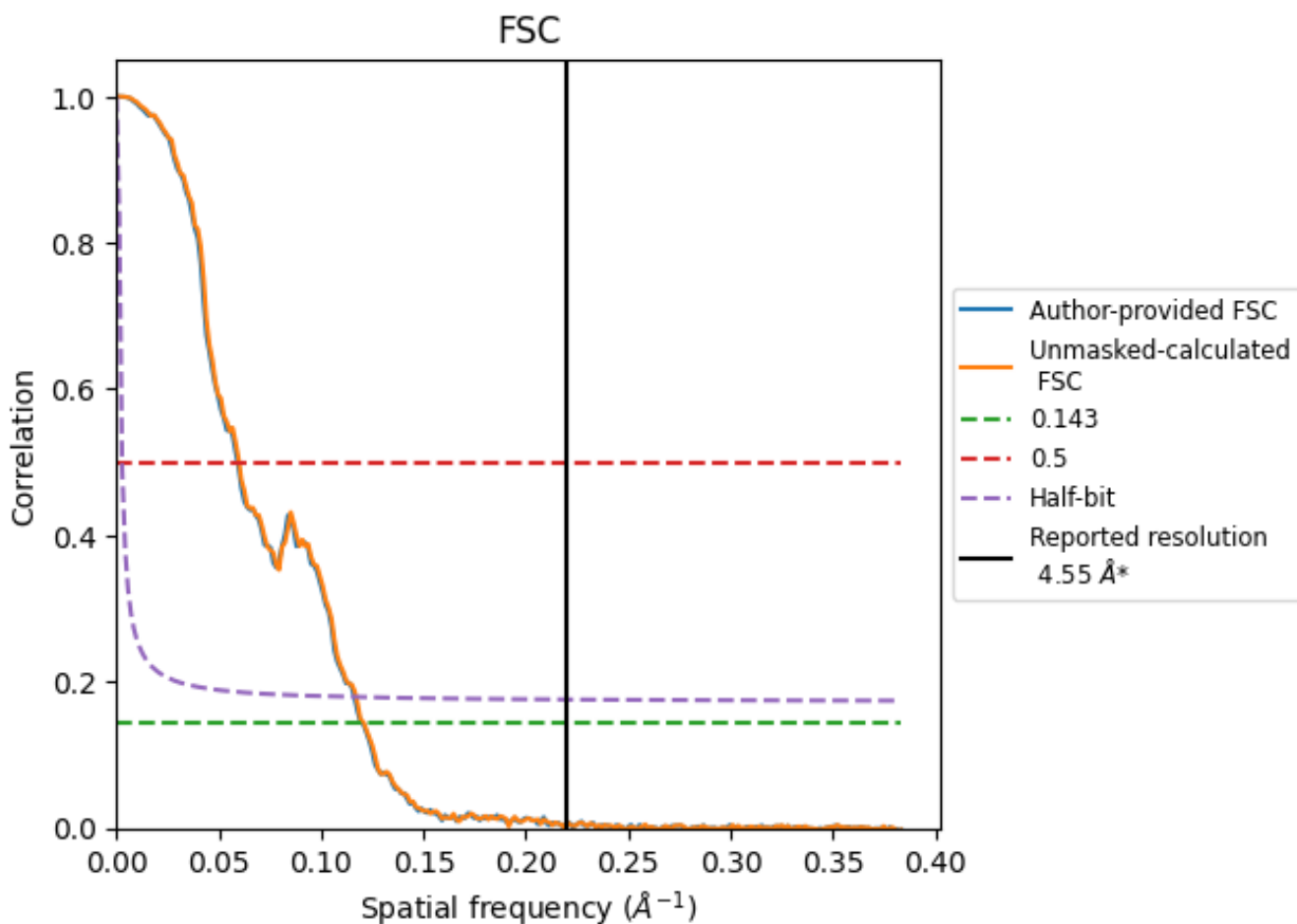


*Reported resolution corresponds to spatial frequency of 0.220 Å⁻¹

8 Fourier-Shell correlation [i](#)

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

8.1 FSC [i](#)



*Reported resolution corresponds to spatial frequency of 0.220 Å⁻¹

8.2 Resolution estimates [i](#)

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	4.55	-	-
Author-provided FSC curve	8.33	16.86	8.61
Unmasked-calculated*	8.27	16.69	8.54

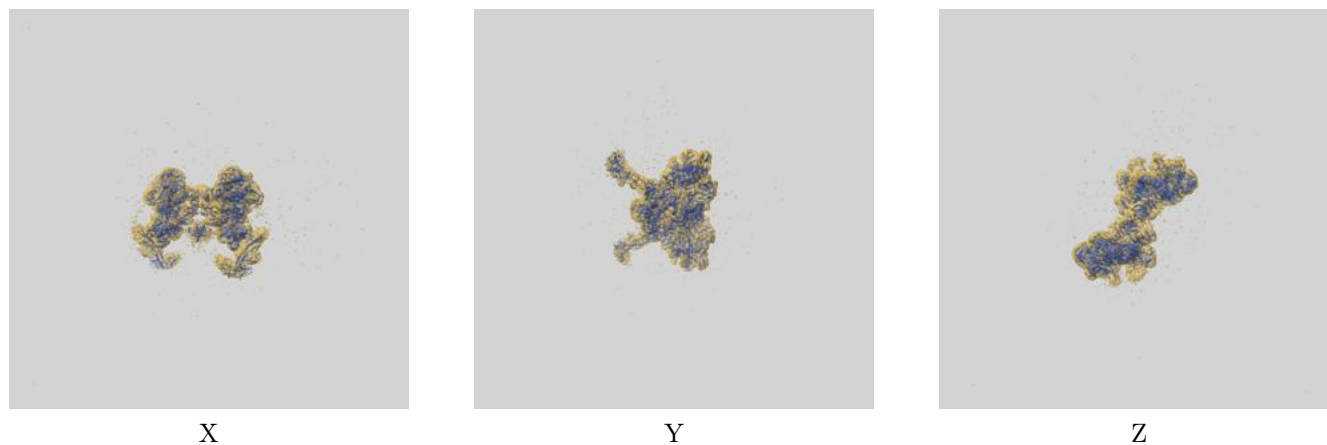
*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from author-provided FSC intersecting FSC 0.143 CUT-OFF 8.33 differs from the reported value 4.55 by more than 10 %

The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 8.27 differs from the reported value 4.55 by more than 10 %

9 Map-model fit [i](#)

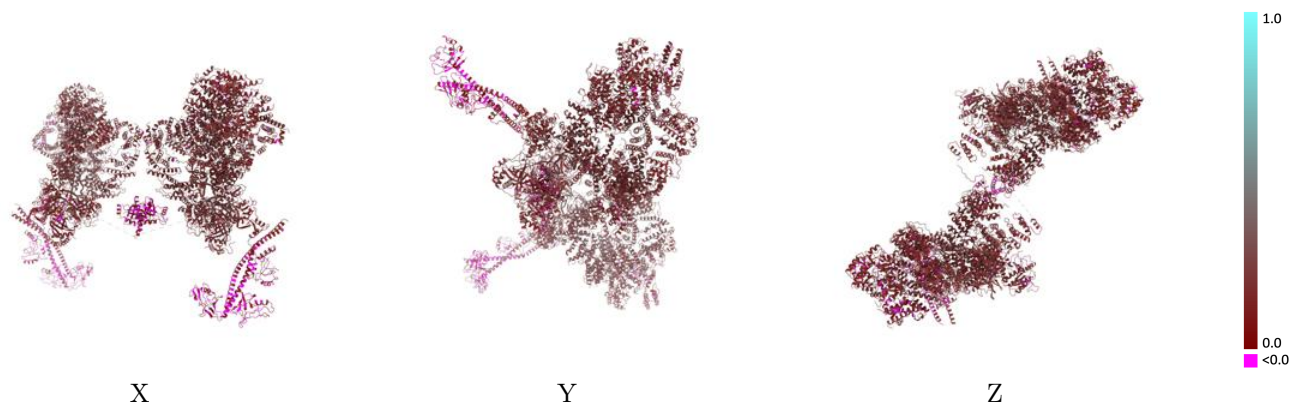
This section contains information regarding the fit between EMDB map EMD-16044 and PDB model 8BH3. Per-residue inclusion information can be found in section 3 on page 6.

9.1 Map-model overlay [i](#)



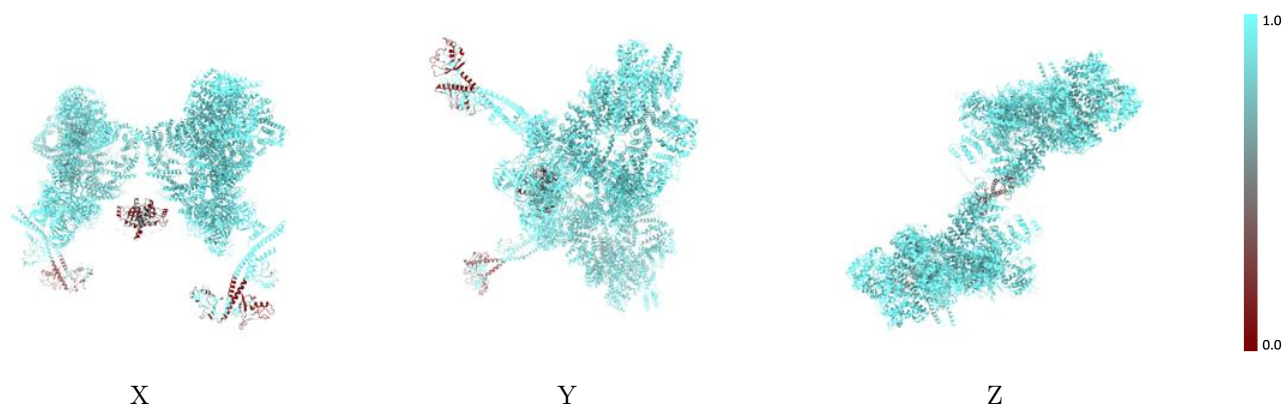
The images above show the 3D surface view of the map at the recommended contour level 0.061 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2 Q-score mapped to coordinate model [i](#)



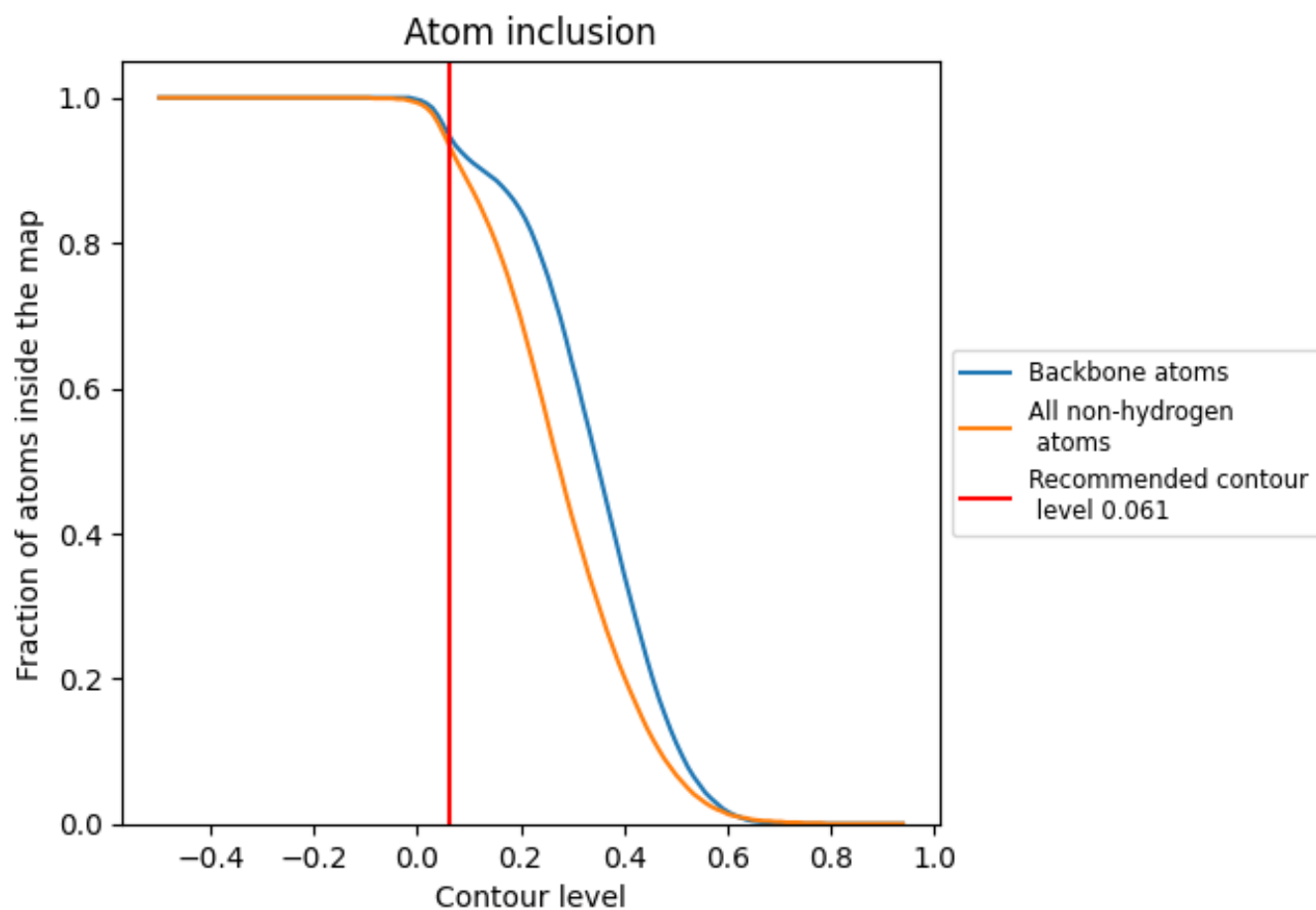
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

9.3 Atom inclusion mapped to coordinate model [i](#)



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.061).







































9.4 Atom inclusion [i](#)



At the recommended contour level, 95% of all backbone atoms, 94% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary

The table lists the average atom inclusion at the recommended contour level (0.061) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.9360	 0.1850
A	 0.9770	 0.2080
B	 0.9830	 0.2240
C	 0.9910	 0.2020
D	 0.3570	 0.0660
G	 0.6710	 0.0690
H	 0.5320	 0.0630
I	 0.9650	 0.1450
L	 0.9950	 0.1760
M	 0.3810	 0.0790
P	 0.5560	 0.0560
Q	 0.5170	 0.0730
R	 0.9550	 0.1280
S	 0.9800	 0.1910
T	 0.9870	 0.1920
d	 0.9920	 0.2600
e	 0.9970	 0.2720
i	 1.0000	 0.2550
j	 0.9900	 0.2460

